

254  
7  
A R S E N I C

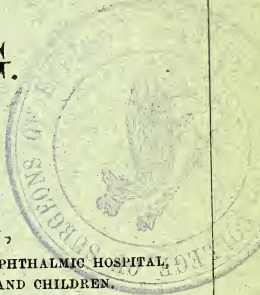
AND

A R S E N I C A L D O M E S T I C  
P O I S O N I N G .

BY

J A B E Z H O G G ,

CONSULTING SURGEON TO THE ROYAL WESTMINSTER OPHTHALMIC HOSPITAL,  
AND THE NORTH-WEST HOSPITAL FOR WOMEN AND CHILDREN.



*Reprinted from* THE MEDICAL PRESS AND CIRCULAR.

L O N D O N :

MCGOWAN'S STEAM PRINTING COMPANY, LIMITED,  
16 GREAT WINDMILL STREET, W.

1879.

arts and manufactures is known to be productive of a two-fold noxious influence ; first, upon the work-people employed in their manufacture ; and secondly, on a very much larger number of persons who purchase them, and who, being quite ignorant of their nature, adorn and surround themselves and their homes with the elements of disease. If in 1875 it appeared just and right of the Legislature of the country to enact that the sale of adulterated articles of food and drinks should be made a penal offence, it is certainly of equal importance to the community at large that similar restrictions should be placed upon the manufacture and sale of goods impregnated with a dangerous poisonous material.

Notwithstanding the humane efforts of men of science, chemists, and physicians, nothing whatever has been done by Parliament to lessen the evil, and spare the infliction of disease and death upon innocent people. It is now many years since the Prussian Government set an example, which, I think, it would have been wise of our Government to follow. It forbade the sale of all articles coloured with arsenical pigments. In France the manufacture and sale of arsenical wall-papers is also wholly prohibited. In Bavaria, the country of the celebrated Liebig, an edict was passed in 1845 prohibiting the manufacture and sale of arsenical pigments. A year or two afterwards, and at the instigation of manufacturers who declared that the enactment was injuring trade, some relaxation took place, but this soon led to greater abuses. Professor Hoffman, who was ordered to make inquiries into them, reported that he had met with a great many cases of chronic poisoning from wall papers, even when they were glazed. Upon this the Government reverted to its original edict, and at once ordered the removal of all Schweinfurt green papers, paints and distemper colours

from the walls of public buildings, schools, hospitals, &c.

The increasing danger of arsenical poisoning was directly brought under the notice of a select committee of the House of Lords in 1857, at the time the Sale of Poisons Bill was framed. Irrefragable evidence was educed by Prof. Dr. Alfred Taylor and other chemists of eminence, of the danger to health from the use of arsenic in various manufactures, but to very little purpose, for when the Act to regulate the sale of arsenic became law, it was seen that whilst it placed restrictions on the sale of this poison in small quantities, it opened the door wide enough to the wholesale purchaser, and it is now the boast of the wall-paper manufacturer that he uses tons of arsenic per week. It is said that if the Act of 1857 were put in force against the wholesale buyer, the trade would be injured—that to prohibit the use of arsenic would involve many of them in difficulties ; but these difficulties, whatever they may be, should not be allowed to stand in way of the public health. Besides, evidence is not wanting that harmless pigments of proved utility and durability are already prepared to replace arsenical colours, and a firm, Messrs. Cooke, of Leeds, I am aware, take every precaution to prevent the slightest introduction of arsenic into their factory, buying all colours used in printing with a guarantee that they are perfectly free from arsenic. Such firms as Messrs. Cooke's are, I believe, quite ready to co-operate with those members of the profession who, being thoroughly conversant with the extent of the evil, desire to see restriction placed upon the employment of arsenical pigments in every shape.

In treating of arsenical poisoning, it might appear necessary to inquire first into the action of arsenic as a remedy, and in what particulars the symptoms of

poisoning as produced by an overdose differ from those observed in wall-paper poisoning. Secondly, whether any greater activity or virulency of the poison is the result of the inhalation of the arsenical dust ; if so, whether this is chiefly due to the form in which the poison is presented and absorbed :—*a.* As finely divided crystalline particles. *b.* As evolved arseniuretted hydrogen gas ; or *c.* As the combined action of dust and gaseous matter.

*The Remedial Action of Arsenic.*—Arsenic has long been regarded as one of the most remarkable therapeutical mineral substances. It has not inaptly been described as a poison in health, and a remedy in disease. Although this description may be regarded as a somewhat curious anomaly, it is nevertheless perfectly true. Nearly all the compounds of arsenic are actively poisonous, the tri-oxide, which is very extensively employed, being the most active. On the other hand, the compounds of arsenic have long been regarded as valuable remedies. As a medicine, arsenic exerts a certain controlling power over morbid actions, and its curative nature may be accepted as of three kinds. First, it is a potent antiperiodic, a very useful one, in ague, in chorea, and in epilepsy. Secondly, it is a nervine tonic of value in the intermittent forms of neuralgia and gastrodynia. Thirdly, it exercises a decidedly antagonistic action, a controlling agency, over other poisons, as in intermittent fever and convulsive disease. In larger doses it has another action, that of a blood poison, or nerve disturber, as seen in its partial arrest of nutrition, and in the production of various local disorders, skin affections.

In the treatment of ague it was at one time believed to possess advantages over quinia, as it may be given with perfect safety during a paroxysm ; and should the cinchona cultivation fail us, it is not at all unlikely that

arsenic may once more become the fashionable remedy it was in our forefathers' days, and again find favour as a "Tasteless Ague-drop."

In intermittent neuralgia and gastrodynia, arsenic acts as a nervine, or, more properly, a nervine tonic, for it soothes pain, promotes assimilation and secretion, and improves the appetite. In some instances it excites both the nervous and muscular functions of the stomach, and thereby digestion is materially invigorated. In intermittent neuralgia, nerve debility, it is beneficial.

It is, nevertheless, an agent quite foreign to the blood, and if no attempt be made to eliminate it from the circulation, it becomes a poisonous irritant, and by a rough and ready method of its own, works its way out of the body. If, therefore, it is not carefully watched, it produces nerve disturbances, inflammation of the skin—dermatitis, headache, giddiness, lassitude, shifting pains, and impaired sensibility of the extremities. That it exerts a specific action over the heart and other vital organs, as the lungs and salivary glands, evinced by the local pains, the irritative cough, and the occasional ptialism is very well known.

Dr. Darwin, the father of the present eminent philosopher, was probably the first to notice the specific action of arsenic over the nervous system and heart. He administered a saturated solution of arsenious acid in a case of heart disease with surprising effect. Full doses of the more soluble preparations of arsenic produce retardation of the heart's action, an effect said to be due to paralysis of the motor ganglia, or rather to a limiting action of the remedy, which renders the muscular tissue of the heart less irritable. From nerve disturbance and interruption of nutrition, we have certain cutaneous diseases, termed generally by Dr. G. Kichgassen arsenic<sup>am</sup> ; by



Mr. Hunt, pityriasis arsenicalis, herpes, eczema, conjunctivitis, &c.

In the treatment of the true squamous or tubercular type of skin affection, arsenic is undoubtedly a valuable remedy. In lepra vulgaris, psoriasis, and in other forms of disease nearly allied, impetigo, porrigo, &c., it is given with benefit. In lepra, unassociated by a syphilitic taint, arsenic exerts "an almost omnipotent influence" (Hunt). If in the hands of some practitioners it fails to be of use, this arises from one of the following causes:—1st, overlooking the syphilitic complication; or 2nd, the administration of the remedy during the inflammatory or febrile stage; or 3rd, forgetting that it should not be given on an empty stomach; or or lastly, prescribing it in too large doses, and long intervals (Hunt). From not observing one or other of these practical rules, arsenic has acquired the reputation of being a cumulative poison. It is found, however, that the danger of accumulation may be entirely obviated if a watch is kept over the mucous membranes. The outer coat of the eye is an unfailing guide, as in ninety-eight cases out of a hundred an increase in the vessels of the conjunctiva takes place, and the irritation, "hot-eye," warns us that it is time to suspend the remedy. The arsenical conjunctivitis thus induced is usually of a mild type, and quickly subsides when the remedy is suspended. The affection is unaccompanied with any great amount of general disturbance; is, in short, of a trivial nature.

Arsenic, when applied externally, as a paste or salve, is a powerful irritant. It is also an escharotic, one that quickly destroys the skin. Its <sup>chemical</sup> caustic action led to a belief that it might prove a specific for cancer and lupus; but from its destructive nature it fell into disrepute, and was

abandoned in the treatment of these diseases. The remarkable nature of the chemical change induced by arsenical paste on the living tissues, is not fully understood, and, therefore, cannot be explained. Arsenic, if applied as a dry powder to the surface of the skin, is scarcely less caustic in its action. A most painful example of this fact occurred not long ago at Stoke Newington, where no less than thirteen infants were most cruelly sacrificed to the culpable greed of adulteration. A chemist anxious to undersell his neighbours, put up a mixture of starch, white arsenic, and some other ingredients, and sold the poisonous compound as violet powder. This was merely *dusted* over the skin in quite an ordinary manner, and produced first an eruptive sore, then excessive ulceration, and sloughing of the cuticle, of so severe a nature as to cause death in the course of a few days. A mixture of arsenic, soft-soap, and tar-water, is largely used in agricultural districts for killing tick in sheep, and has been known to cause death in some instances, the animals dying from the usual symptoms of acute arsenical poisoning. A mixture of arsenite of potash, is also a good deal used by farmers ; and is of a no less dangerous nature, unless very carefully employed (Taylor).

The action of arsenic, however, like that of other drugs, is variable ; but the extreme susceptibility, idiosyncrasy, exhibited by some persons to its toxic qualities, is quite as remarkable as is the perfect indifference to large doses shown by others. As an instance of indifference to its action, I may point to the people of Upper Styria, who regard it with feelings somewhat akin to the tobacco-smoker or chewer. These people believe that it increases strength, enables them to carry heavy loads with less fatigue. Prof. Roscoe took some trouble to verify the statements made with regard to arsenic-eating. A woodcutter, he

writes, was seen by a member of our profession to eat a piece of crude arsenic weighing upwards of four grains. Another ate with impunity a piece much larger. Arsenic is given to horses in considerable quantities ; it is believed to increase the appetite and the activity of the older and feebler animals. Grooms give it largely for other purposes ; as that of improving the coat of the horse, and as a remedy in skin disease. This was the use Mr. Bravo's groom was said to make of arsenic found in his possession at the time of his master's tragical death.

There are, however, only a very few cases on record in which the medicinal preparations of arsenic have been known to destroy life. A case was published some years ago, of a woman who took half an ounce of Fowler's solution of arsenic, and died from its effects. There was no vomiting or purging, and in this particular the symptoms differed from those of the following extraordinary case of poisoning by arsenic lately reported to have occurred at Huddersfield. A woman, who had been in the habit of taking prepared chalk to relieve heartburn, was attacked after taking a dose, with sickness and abdominal pains, which were not relieved by the administration of remedies. In five days the woman died, and a post-mortem examination revealed the fact of arsenical poisoning. It was then discovered that the powder sold by the druggist was " French chalk," in mistake for prepared chalk ; and that this French chalk contained as much as 40 per cent. of arsenic.

*The Symptoms of Arsenical-dust Poisoning.*—The special symptoms of chronic poisoning produced by the introduction of arsenical pigments into our domestic manufactures, are as follows : The earliest indication of the absorption of the poison, that most frequently observed, is an excessive irritation of the whole of the

*Professor D. Taylor informs me that  
very many horses are poisoned from*



mucons tract, and which is nearly always referred to a catarrhal attack. If any improvement follows the use of ordinary remedies in such a case, it is of a temporary nature ; more frequently as the nasal irritation subsides, a feeling of faintness, sickness, headache, and great prostration supervenes. The patient improves in the course of the day, and tries to believe that he is not so very ill after all, although the next day he may be obliged to lay up. In other patients the first symptoms of poisoning are dyspepsia, stomach derangement, and cramp ; these are referred to a bilious attack. A person sleeping in a room newly-papered, will have a severe attack of diarrhoea or sickness ; awake unrefreshed, complaining of headache, sore throat, smarting and running of the eyes, &c. It has frequently been noticed that breathing the air of a room impregnated with arsenical dust, after the servant or nurse has been dusting the room and moving about, produces an aggravated form of hay-fever, spasmodic asthma, or bronchitis. In other instances, fainting fits, irritative fever, heart disease, vomiting, diarrhoea, nervous prostration, skin-eruptions, conjunctivitis, "hot eye," dimness of sight, paralysis, &c., follow in regular sequence.

The following symptoms may be enumerated as having been amongst those observed in connection with cases of wall-paper poisoning : violent fits of sneezing, lachrymation, sore-throat, short dry cough, difficulty of breathing, asthma, bronchitis, fainting fits, irregularity of the heart's action, constant headache, nausea, vomiting, diarrhoea, excessive thirst, eruptions and ulcerations of the skin, inflammation of the eye, nervous depression, general debility, prostration, cramps, colic, palsy, paralysis of the extremities, coma, death. In short, I believe that when arsenical dust poisoning comes to be thoroughly

investigated it will be found that the danger to public health is quite as great as that arising from sewer gas, or impure drinking water. Many of the earliest symptoms of poisoning are shrouded in mystery, and, consequently, for every case of chronic poisoning made known, hundreds possibly pass unnoticed or unrecognised. It is, I should think, scarcely possible to adduce stronger proof, or a more well-marked example of cause and effect, than that observed on the removal of the patient from a room or house, suffering from an alarming form of illness, when an almost magical cure follows. A large number of cases, vouched for on unimpeachable authority, have been made public, and it is impossible to resist the accumulated amount of evidence of domestic arsenical poisoning. A few instances will suffice to show this—a member of Parliament was known to suffer for months from a painful eruption of the feet, the symptoms were severe, and confined him to the house and the couch. At length the disease was clearly traced to the fashionable socks he was wearing; on abandoning which he quickly recovered. Several Californian miners actually died from wearing boots lined with a bright green flannel; the colouring matter being Scheele's green. A strong, healthy-looking tradesman suffered intensely from wearing a bright maroon flannel shirt next his skin. Poisoning has been known to occur from wearing paper collars, glazed and stiffened with size containing arsenical pigment; from coloured calico shirts, from gloves, coat-sleeve and hat linings. A lady suffered from a painful form of skin disease, from constantly carrying about in her hand a yellow purse, whilst another suffered from the dye which came off a black crape dress she was wearing. Five or six members of a family were made severely ill by the chintz window curtains, and the bed

furniture of the rooms in which they slept. Another family through green Venetian blinds, from which, during the heat of summer, arsenic was given off. A lady suffered many weeks from a troublesome eruption of the skin of the head from wearing artificial flowers in her cap and bonnet. Illness in a number of young children was brought about by the cloth lining of perambulators; eye diseases in a number of compositors from the green gas-shades distributed about the composing room. The distemper colour on the walls has been known to seriously affect the health of office clerks.

The pigment known as arsenite of copper is a good deal used in colouring confectionery, chocolates, gelatines, &c. In one instance, the subject of a criminal trial, it was employed to give a fine green colour to the blanc-mange served at a public dinner, which caused the death of a gentleman who partook of it. The cook, supposing the green colour was merely an extract of spinach, produced a dish more pleasing to the eye than the stomach. Arsenical pigments are used as colouring for pomades, producing serious scalp eruptions. It may be stated, however, that the symptoms of wall-paper poisoning present scarcely more than one or two in common with those of arsenic administered as a remedy. We might almost say the symptoms in common are those of certain forms of skin disease; but here, again, this can scarcely be relied upon, and we are in danger of falling into an error of diagnosis for another reason—that comparatively harmless drugs will produce irritative cutaneous affections. For instance, work-people employed in the manufacture of quinine suffer from irritation and inflammation of the eyes, catarrh, and eczema of the hands and arms. Patches of pustules also appear from the same cause, ulcerate, and produce much discomfort. The irritative skin affection set up by this

and other substances is generally attributed to the mechanical action of the needle-like crystals of the substance, this will not explain the cause of bakers' eczema, nor the dust of linseed meal, which produces in the grinder the symptoms of chronic asthma.

*Pigments Employed in Paper-Staining.*—Of the several arsenical preparations employed in wall-paper printing, the most dangerous, because the most extensively used, is the trioxide. This is a principal ingredient in Scheele's green, a fine green powder composed of one part of arsenic trioxide, and two of cupric oxide. Schwienfurt, Brunswick, Vienna, or emerald green, is an aceto-arsenite of copper, a preparation rather extensively employed by paper stainers, both unmixed and mixed with zinc oxide in various proportions, to produce the more delicate tints of green. Another pigment is composed of chromic and ferric arsenate, whilst arsenious acid is used on a large scale in the preparation of aniline dyes, and of red anilines in particular. Sodium arsenite is almost exclusively used in calico-printing, and alumina arsenate for fixing colours. In every case the arsenical pigment is mixed with size or organic matter of some kind, and in this way it is made to adhere to the surface of paper and fibres of which muslins are composed ; the consequence is, that after it becomes thoroughly dry, the colour cracks and peels off when only gentle friction is applied. Then, again, arsenic in some of its more potent forms is extremely volatile. At a moderate heat it passes from the solid to the gaseous state, and may be detected by its yellowish colour and alliaceous odour ; and although the colour and smell might not attract the attention of the ordinary observer, it is, nevertheless, a fact that an appreciable quantity of gaseous and solid particles of arsenic will be separated and diffused by the action of the

air of an ordinary sitting room, especially during summer time when the air is damp or moist. It may be thought that the quantity given off is too small to produce symptoms of poisoning. But this is a hasty conclusion to arrive at, for on analysis Dr. A. Taylor found that from each square foot of arsenical paper, he was able to produce from fourteen to seventeen grains of arsenic ; and from certain papers printed with a peculiar pigment he obtained as much as fifty-nine per cent. of arsenious acid.

Beside the "devil's dust," there is the arseniuretted hydrogen evolved by the decomposition of the organic matter mixed in with the arsenic, and which is absorbed more rapidly than the dust, by the lungs and the whole cutaneous surface. Arseniuretted hydrogen which contains one grain of arsenic in each cubic inch of gas is known as a most deadly poison. On the whole, then, arsenical preparations are of a very volatile nature, and this renders them more virulent ; Dr. Tidy tells us, that "volatility and virulency usually go together," and we seem to have the fact exemplified in arsenical poisoning from wall-papers and other articles. With regard to colour it is very generally believed that only green papers are dangerous. This is a fallacy, a number of other colours are quite as poisonous. Blue, mauve, red, brown, and even white papers have been found, on examination, to be arsenical. Only a short time ago French colour makers introduced into England a variety of attractive arsenical colours for the especial use of manufacturers. These colours were all more or less poisonous, and, as usual the more attractive, as yellows, reds, violets, mauves, browns, greys, besides every shade of green, the fixing agent being oxide of chromium, a most dangerous addition to any pigment. The public should be put on its guard against French imported articles of domestic use,



dyed with these colours. It is considered by some persons to be somewhat doubtful whether white papers contain arsenic, and I have endeavoured to clear up this point. On careful inquiry, I have ascertained that arsenic finds its way into almost all papers, quite independently of the surface colour, in this way. The size used for fixing the pigment on the paper is very prone to decomposition; to prevent this, makers introduce arsenic. Size is also largely employed by paper-hangers — first, for preparing the walls, and secondly, in hanging the paper. Arsenic is likewise much used by white-washers, and in distemper colouring of walls and ceilings of rooms. With regard to the colour of wall-papers, I have the authority of Prof. Heisch for saying that samples of French greys and whites have been carefully tested by him and found very arsenical. Furthermore, that a paper-hanger, largely employed, assures him that the men who work with him suffer more whilst hanging grey papers than almost any others. Prof. Dr. Hodges, of Belfast, informs me that he has discovered arsenic in very many other papers beside greens. He adds: "I have seen a number of cases of poisoning from variously coloured arsenical papers. One lately impressed me very much. It was that of the daughter of a clergyman who for years had been a great sufferer from headache, throat irritation, &c., which resisted all treatment. Her bedroom, as well as other rooms in the house, were covered with papers (not green) containing a large amount of arsenic; on their removal her health rapidly improved, and she was soon quite restored." Another lady, Mrs. Stelfox, writes Dr. Hodges: "I can scarcely describe the peculiar nature of the symptoms experienced by myself. But with regard to my child, she was rendered utterly sleepless;

waking every few minutes through the whole of the night, and always with a sharp piercing cry. The nurse's impression was, that the child was choking, as she always, on waking up, asked for drink. The whole of the unpleasant symptoms ceased when, on your recommendation, she was removed to another room. This was, of course, after the nursery paper was tested by you and found arsenical. I therefore hope something will be done to put a stop to this dreadful system of poisoning." Miss Osborne, of the Sydney Hospital, in a letter, dated March, 1879, writes: "I was speaking to the foreman of the largest firm of painters and decorators here on the subject of arsenical wall-paper poisoning, and he quite confirms all you say of the deleterious nature of the substances used in wall-papers and paints." He adds, "Confectioners come to our shop for large quantities of colours, some of them harmless enough, others poisonous enough, for colouring lollies (sweets), and the quantity of these sweets consumed by young and old in the colony is something marvellous." (a)

The animal creation has not escaped the dangers of arsenical wall-paper poisoning. Mr. Fred. Greeves, of Emneth, Cambridgeshire, complains of having recently lost three beasts from this cause. It appears that, in the course of cleaning, some green paper was torn from the walls of the house in which he lives, and thrown into the yard where the stock got at it. Three beasts seem to have eaten a portion of the paper and were seized with

---

(a) For other cases of poisoning, with a detail of the symptoms, I must refer to my paper read at the Medical Society of London, and printed *in extenso* in the *Sanitary Record* of April 25th. After the reading of this paper a committee was formed to collect further evidence on this important subject. See also cases in *British Medical Journal* of June 14th.

illness. A veterinary surgeon was called in; two of the animals however died, and on being opened was discovered arsenic, the arsenic in the paper was the cause of death. Subsequently a third died from the same cause.

Late investigations have, I venture to think, brought to light a few important facts in connection with the subject of arsenical domestic poisoning, the symptoms of which certainly differ from those observed after the administration of arsenic as a remedy.

The dangers are, first, those arising from the microscopic arsenious acid crystals, which being separated from the paper by the action of currents of heated air, float about and are inhaled and absorbed by the mucous membranes and the skin; secondly, from the volatile, gaseous products, arseniuretted hydrogen, liberated by decomposition of the organic matter mixed with the pigments, and which are likewise inhaled and absorbed by the vascular surfaces of the lungs, air-passages, and cutaneous surface. The danger to the public health will not be met by simply contenting ourselves by raising a warning voice, Parliamentary action must be evoked in the matter, and manufacturers and sellers of a poisonous material must be placed under the Adulteration Act and made answerable for the injury done to health and life.